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THE AMERICAN GAS LIGHT JOURNAL

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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND CLASS MATTER.

[OFFICIAL NOTICE.]

Appointment of a Committee of Reception by the American Gas Light Association.

AMERICAN GAS LIGHT ASSOCIATION, OFFICE OF SECRETARY,
PROVIDENCE, R. I., June 5th, 1893.

The following named members of this Association are appointed and respectfully requested to serve as a Committee of Reception, whose duty shall be to call upon all foreign gas engineers visiting our country during the continuance of the World's Fair at Chicago, whose names and addresses may be obtained, and to introduce them to other members of our profession, see that they obtain permits to visit the neighboring gas works and other objects of interest, and generally to make their stay in New York as pleasant as possible, and when they leave for Chicago, to give them letters of introduction to the Committee of Arrangements at Chicago: Messrs. Wm. Henry White (chairman), Eugene Vanderpool, William H. Bradley, Fred. S. Benson, William R. Beal, Thos. F. Rowland, Jr., Fred. W. Floyd and Oscar Weber.

The Guild of Gas Managers and the Society of Gas Lighting are respectfully requested to co-operate with this committee in extending hospitality to our visiting professional brethren.

A. E. BOARDMAN, President.

A. B. SLATER, JR., Secretary.

[OFFICIAL NOTICE.]

The American Gas Light Association's Greeting to European Gas Engineers.

AMERICAN GAS LIGHT ASSOCIATION, OFFICE OF SECRETARY,
PROVIDENCE, R. I., June 5th, 1893.

To the European Gas Engineers—Greeting: The American Gas Light Association will hold its 21st annual convention in the city of Chicago, beginning on the date of Wednesday, October 18th, 1893. It would give the members of the Association great pleasure to meet there as many of the European gas engineers and managers as can make it convenient to be in attendance at the World's Fair at that time. It is suggested that all contemplating visiting the Fair arrange their visits so as to be in Chicago, if possible, at the time of this convention, when they will be most cordially welcomed by the Association and invited to attend the sittings of the body and participate in its discussions of papers presented.

Those engineers who cannot conveniently visit the World's Fair at that time, but must choose some other date, are respectfully requested to send their names and addresses, as soon as they arrive in America, to the AMERICAN GAS LIGHT JOURNAL, No. 32 Pine street, New York City, so that a committee from the Association may be made aware of their presence, and when they may be met, so that they may form the acquaintance of their professional brethren in this country and be made to feel less like a "stranger in a strange land."

A. E. BOARDMAN, President.

A. B. SLATER, JR., Secretary.

BRIEFLY TOLD.

THE DECISION OF THE MASSACHUSETTS STATE COMMISSION IN RESPECT TO GAS RATES IN BOSTON.—On pages 889 and 890 of our current issue will be found the text of the decision of the Massachusetts Board of Gas and Electric Light Commissioners, by which they virtually fix the rates that may be charged for gas in the Boston districts of Roxbury, Dorchester and South Boston, the Companies in which districts are virtually, in fact actually, controlled by the proprietors of the Bay State Gas Company. To begin with, it is most satisfactory to us to be able to say that the Commissioners have acted in these latest instances with that fairness which has characterized *all* of their rulings, when appealed to to exercise their quasi-judicial functions, and we believe that both companies and consumers will accept the terms of the settlement as binding and equitable without further recourse to the lawyers and the law. The disturbances that have existed within the twelvemonth in the gas situation at Boston have been many, complex and malodorous, and if (as we believe) the Commissioners have succeeded in clearing the gas atmosphere there of its exceeding density, their coolness and commonsense must command commendation, and furnish convincing evidence that they are fully up to the purposes for which they were appointed—a barrier between the unreasonableness of the gas consumer and a stay to improper and unjust demands on the part of capital. The attacks on the Bay State Gas Company, in so far as the Mayor and the Commonwealth of Boston were concerned, had their inception in politics of the dirty sort or of a nature equal to those that originally permitted the Bay State Gas Company to secure a foothold in the Boston gas field. It is freely charged that Mayor Matthews has political ambitions, which take on the shape of a desire to be his party's standard bearer in the next campaign for the Governorship of the State, and in casting about for an "evil" to reform, which would enable him to pose before the State as an enemy of corporations, he turned to Boston's gas supply and so secured his "issue." It is true that one outcome of the agitation was the lowering of the gas rate in Boston proper to $1 per 1,000; but this could have been achieved—in fact, practically was achieved subsequently by a simple order from the Commissioners—by an appeal to the Commission, without any beclouding of the issue. It certainly is hard to reconcile the propinquity of gas and politics, but the vagaries of American politicians are such that, when occasion arises or is forced, oil and water frequently intermix, to surface appearances at least. This whole gas imbroglio at Boston shows a very diseased condition of the business, which is, however, the only natural outcome of the pre-natals of the birth of the Bay State Company, and the sequence thereto is likely to be the retirement from the field of some of those who were and are prominent in the direction of the Bay State and the Boston Gas Light Companies. It is too bad that those who wear unclean linen sometimes feel obliged to flaunt the same to the gaze of those who prefer to garb themselves in clean linen, and who, from nature and habit, wear it as it should be be worn, but it is also refreshing to know that a second flap of the "dirty shirt" usually results in the returning of the same to the custody of the laundress, for renovation, or else leads to the banishment of the wearer who chooses to defy the eyes and nostrils of others who, in respecting themselves, pay due regard to the rights of others. Apart from all this, it will be admitted by an impartial observer that the maximum rates named by the Commissioners—for Roxbury, $1 20 per 1,000; Dorchester, $1.30; South Boston, $1.30—are fair and even—to the Bay State Company and to the consumers concerned as well.

THE LESSON OF THE TIMES.—Writing of these reductions recalls to mind the fact that within the twelvemonth the columns of the JOURNAL have abounded in notifications that rates have been voluntarily reduced. It is also noticeable that the percentages of the reductions have been in good, round sums; that is, the proprietors have not ordered decreases of 5 or 10 cents per 1,000, but rather in multiples of these. Nor could any better testimony to the innate strength of the gas business be offered than by this. Our readers know our position in respect of the good policy of selling gas cheaply, for in and out of season we have advocated the benefits of that practice. Nor do we counsel it from motives of philanthropy to the gas consumer. Far from the latter, indeed, since we urge it on the ground that the practice means greater safety and more profit to the sellers of gas. Charity, we are told, should begin at home, and if by practicing charity we enrich ourselves, it should be the easiest of all virtues to exploit, and the most satisfactory, too.

NOTES.—Mr. W. H. Sherman has resigned the Superintendency of the Portage (Wis.) American Gas Company, and Mr. J. H. Moren, formerly in charge of the plant at Greenville, O., succeeds him.——We are informed that the scheme for the promotion of an opposition Company at Montreal is virtually dead, and that Messrs. Coates and King, who were the nominal promoters of the opposition venture, have decided to withdraw.——The manufacturers of cast iron pipe are overwhelmed with orders. One very competent estimator asserts that the gas companies of the country will put down a total pipe mileage this year exceeding the mileage put down for the last 5 years!

Notes on the Application of Oxygen to Lime Purification at Shrewsbury.

[A paper read by Mr. W. Belton before the Incorporated Institution of Gas Engineers.]

Almost everything possible appears to have been written and said upon the use of oxygen in gas purification, and upon the "air process," which is so closely allied with it, that the consideration of the principles and properties of the one must apply with greater or less force to the other; and the author, having already furnished all the information at his disposal to many inquirers, doubted whether any further contribution by him would prove of sufficient interest to warrant its being brought before the members of this Institution. It was, however, desired that he should prepare a paper upon the subject for this meeting; and his experiences have therefore been noted down.

Shrewsbury is a residential town, and the gas works occupy the site (with some additions) upon which they were erected in 1820—at that time outside the town. The works are now, however, surrounded by house property. Their area is extremely limited; and the site cannot be extended. There is only coal storage for two weeks' supply in mid-winter; and, indeed, a few years ago, it was impossible to find room for oxide revivification by the then ordinary method. Partly on this account, and partly because of the difficulty of satisfying the corporation in the matter of purity and illuminating power, the use of oxide was altogether abandoned; lime being comparatively cheap and more effective under the circumstances. The Shrewsbury Gas Act fixes a standard illuminating power of 15 candles, and a limit of 20 grains of sulphur; but the corporation require much more than this, and do not fail to complain if, by any chance, the illuminating power is not more than one candle above the standard, or the sulphur compounds more than one-half the limit, according to their tests. The latter, it may be remarked in passing, generally differ from those made by the Company's officers.

It is needless to recount the difficulties of sulphur purification—they are well known to all of you; nor the necessity, in a situation such as has been described, of preventing all possible nuisance therefrom. In residential towns, where odors arising from gas works have to go forth undiluted by those from other factories, noses are so very sensitive that it is difficult to even open a purifier without causing complaints and threats to pour in; and, on one occasion, complaints were made of the nuisance arising from a set of purifiers that had not only never been used, but the erection of which was not completed. No other purifiers were or had been open about that time; and no nuisance at all existed. The discomfiture of those who made the complaints, and who eagerly accepted a prompt invitation to enter the works and find for themselves whence the nuisance proceeded, was most complete; and its after-effects were very beneficial.

It was these and other considerations, and perhaps some ambition not to lag behind on this or any other question, that induced the Directors to desire an investigation as to what improvements could be effected in purification; not altogether on the score of economy, for lime purification was then being effected for 0.71d. per 1,000 cubic feet of gas sold, but because they desired to turn out the gas as pure as could reasonably be expected, and to put themselves in a position to say they had done all they possibly could, and had adopted and practiced the best known method of securing purity without causing a nuisance. Several schemes were considered—*i. e.*, separate bisulphide vessels, the Claus system, the oxygen process, and its near relative, the air process. It is not proposed to enter into the merits or demerits of all these, but broadly to give the reasons for selecting the oxygen process.

The use of separate bisulphide vessels was objectionable, because of the nuisance caused when opened, though this might be seldom, and would also involve further overcrowding of the works, with loss of part of the already insufficient coal storage, besides incurring considerable cost for alterations to buildings, connections, etc., in addition to the outlay for the boxes themselves. It was considered that the Claus system had not yet arrived at such a state of promise as would justify the expenditure necessary for its introduction. There remained the oxygen process and the air process, both of which required fuller consideration.

It was promised for the oxygen process that the purification would be effected in fewer and smaller vessels; that the lime would do more work and leave the purifiers quite deodorized; and that there would be a large gain in illuminating power. Investigation at Ramsgate and in London, and some careful small scale experiments at Shrewsbury, tended to confirm these promises, though not to the extent claimed by the advocates of the system; the main difference being that these experiments and investigations showed a gain of 1 to 1¼ candles illuminating power, as against a much larger gain claimed. This is attributed chiefly to the

fact that the carbon dioxide had long been completely removed at Shrewsbury. Inquiries elicited that the air process would also reduce the necessary purifying area, increase the efficiency of the lime, and also deodorize it; but no gain in illuminating power was promised. It was only stated that there would be no loss if the percentage used was not too great, but that a gain might be obtained, and a larger percentage used, if the air was first carbureted.

The consideration of these two processes, in the light of the theory that 0.1 per cent. of oxygen is necessary for the complete oxidation of every 100 grains of sulphur per 100 feet of gas, showed that while, with a low sulphur percentage in the foul gas, sufficient air might be used to provide the required quantity of oxygen without loss of illuminating power, if coals were used which gave a high percentage of sulphur, the quantity necessary would very probably deteriorate the gas considerably unless carbureted, and that it was doubtful how far such carbureting would be efficient or permanent. The proportion of oxygen existing in air being about 21 parts in 100, there are 79 parts of inert nitrogen which must go with it, which, if it did not actually show any deterioration of the gas at the outlet of the purifiers, must inevitably counteract any improvement effected by the oxygen, as it would be passed on (still inert) whenever the oxygen was taking effect on the sulphur.

Thus, with gas containing 600 grains of sulphureted hydrogen, 0.6 per cent. of oxygen would be theoretically necessary, which would be furnished by 2.86 per cent. of air, of which 2.26 per cent. is inert nitrogen. But with gas containing 1,200 grains of sulphureted hydrogen, double the quantity would theoretically be required; and it was understood that the safe limit was much lower. At Shrewsbury, coal is drawn from various districts—sometimes from two or three at once; and the percentage of sulphur in the gas is found to vary from 500 to 1,200 grains. It therefore appeared that, for a thoroughly satisfactory use of oxygen, the oxygen process itself must be adopted, wherein its influence would be untrammeled by the presence of inert nitrogen, and that any possible advantage to our station meter record by the use of air, carbureted or otherwise, must be abandoned for the more solid advantage of applying a scientific process in a scientific way, so as to obtain the best results without the probability of losing the greater part of them, as soon as gained, through dilution of the agent employed.

Of course, the financial aspect of these questions was not neglected; and here it was considered that, on all accounts, there was really very little to choose. If the air process cost little or nothing, it did not promise any material saving; and the oxygen process, though promising more, would also be more expensive. It was at that time difficult to estimate the cost or gain in either case. But careful consideration showed that the balance, if any, ought to be in favor of the oxygen process; and it was therefore decided to adopt it.

The plant was supplied by the Brin Oxygen Company, and erected by the Gas Company, who also provided a gasholder and distributory apparatus. When complete, the plant consisted of the following appliances: A double-acting vertical air pump, steam driven, and capable of maintaining a vacuum of 28 inches of mercury; automatic machinery for reversing the valves belonging to plant, geared to the pump driving shaft; a lime purifier; a caustic soda purifier; a set of 12 straight steel retorts, 6 inches in diameter, set vertically in 2 chambers on either side of a generator furnace with superposed combustion chamber; anhydrous oxide of barium for charging the retorts; covers and weldless steel branch pipes to close and connect the retorts; a hand-change valve, for reversing the direction of the current through the retorts; connections, partly copper, partly iron (including a cast iron empty catch box) between the purifiers and the valves attached to the reversing gear; a gasholder, 16 feet in diameter and 15 feet deep, having a capacity of 3,000 cubic feet, provided for water weighing on the top, complete in cast iron tank; an automatic distributing apparatus as patented by Mr. C. B. Newton, actuated by electricity from the station meter; and valves and connections to the gasholder, distributory plant, and to the foul gas main leading to the purifiers.

It was stated that it would be necessary to remove and break up the barium about every two months. Certain alterations have, however, been made to the plant since its erection. The combustion chamber of the furnace has been divided by a vertical wall in the center; thus enabling one side of the setting to be worked without the other, and so facilitating repairs or changes of barium being made without stopping the oxygen supply. A copper catch box, filled with washed hair, has been fixed on the main connections leading to the retorts. Cast iron taper retorts have been substituted for the parallel steel ones. The hand-change valve has been discarded for an automatic valve actuated by the pressure in the retort connections, and changing the direction of the current every time exhaust gives way to pressure.

The general result of these changes has been to render the automatic character of the plant much more complete, and to lengthen the life of the barium, so that it has been workable for twelve months without any necessity for change, and without very material deterioration.

It is believed that this plant and the present Ramsgate plant were ordered and erected simultaneously, and were the first of their kind—thus furnishing experience rather than being the result of it; and the estimate of the yield of oxygen from the barium employed proved too sanguine. This may have been due not so much to the absorptive capacity of the barium being over-estimated, as to the difficulty of obtaining a sufficiently high vacuum—28 inches being insufficient to thoroughly exhaust the oxygen from the barium in the space of time allotted. It is known that much better results are obtained with 29 inches of vacuum; and in this direction it is believed further improvements are being made. The Brin Oxygen Company are now providing for this purpose pumps having improved slide-valve cylinders, in which a small passage is made in the valve in addition to the ordinary passages. This small passage is so arranged that, when the piston is at the end of its stroke, with the holder pressure on one side and the full vacuum of the plant on the other, communication on either side of the piston is established, and the small clearance spaces under the holder pressure are instantly shifted into the larger space under vacuum, with the result that a vacuum is established throughout the cylinder and passages a little less than the original vacuum at the back of the piston, but amounting to about 27 inches of mercury. When the piston returns on its stroke, instead of having to reduce the pressure in all the clearance spaces first (which means a travel of nearly half the entire stroke), it commences at once at a high vacuum, does useful work throughout the entire stroke, and creates a higher vacuum than could otherwise be obtained—probably within a quarter of an inch of perfect vacuum—which must give an enormous advantage in this process, by increasing the yield of oxygen per pound of barium.

Another improvement may be made by arranging the setting so as to more completely protect the retorts from the effects of the furnace gases, thus prolonging their lives. The retorts may in this way be made to last for three or even four years; and it is intended to attempt this at Shrewsbury, in the hope of securing some such result. The present retorts require changing after two years' regular work.

Turning to the attention required to work the plant, it will be found that it is comparatively trifling, and consists of firing and cleaning the retort furnace daily; changing the barium in the retorts (about four men, six days each), once a year; oiling and cleaning the pump and changing gear daily; lifting and oiling the valves of the changing gear (about two hours weekly); changing the purifiers when exhausted (three men, two hours each, about every three weeks); cleaning the automatic change valve (about two hours once in two months); and recharging the battery for the distributory plant once a year. Besides these, the works fitter, in the course of his daily supervision, will sometimes find it necessary to make some adjustment, or whatever else may be required to keep the plant perfectly tight.

Of these items, only the furnace attention is definitely paid for; and it is so little that it is undertaken by a stoker on each 12-hour shift, in addition to his usual work, for an acknowledgment of 1s. 9d. per week. All the other work is performed, in the ordinary course of duty, by men already employed, without extra pay. Although satisfactory in itself, this renders it somewhat difficult to arrive at the exact cost of oxygen per 1,000 feet.

With regard to the application of the oxygen and the results obtained, it has been before mentioned that the theory was propounded that 0.1 per cent. of oxygen was required for the complete oxidation of 100 grains of sulphureted hydrogen in 100 cubic feet of foul gas. It was also stated that an excess of about 0.2 per cent. of oxygen would effect improvement in the illuminating power; and as at that time the sulphureted hydrogen present in the gas was 600 grains, a commencement was made by using 0.8 per cent. of oxygen. Previously two sets of purifiers were in action. Now only one set of four in sequence is worked—two being quite fouled, and one partially so; and oxygen was first introduced under these conditions. It was found, however, that no effect of any sort was observable for some little time; and it was not until all the purifiers which had been fouled before the introduction of the oxygen had been changed, that the full benefit of it began to be apparent.

Some time after this the effect was tried of introducing oxygen into a set of purifiers newly charged, and therefore all clean; reducing the quantity so as to allow of the formation of some calcium sulphide, after which it was used in the same proportion—viz., 0.8 per cent. In both cases good results were obtained as soon as the oxygen had time to take effect, which was much quicker in the latter case; but no material in-

crease of illuminating power resulted until considerable heat was set up in the purifiers, which, where lime only is used, requires some time. These purifiers have an area of 480 square feet each, and are charged with five layers of lime—giving a depth of 2 feet 4 inches in each purifier; experience teaching that lime purification is more effective with thin layers than with heavy masses. For a while afterwards, less than 7 grains of total sulphur were found in the purified gas; and it also appeared that in summer the 11 or 12 per cent. of English cannel that had previously been used could be entirely dispensed with and the supply of gas maintained at about 17 candles. But after a time the carbon bisulphide present in the purified gas began to increase—at first slowly, then rapidly; and an investigation showed that the carbon dioxide had overtaken the sulphureted hydrogen, leaving no calcium sulphide to assist in the removal of the carbon bisulphide.

By means of long-continued experiments, it was proved that this must inevitably occur at varying, though considerable intervals, if an excess of oxygen was regularly passed through the purifiers; and that it was brought about sooner in summer with a slow flow of gas than in winter with a more rapid flow, no doubt because the longer contact favored more complete oxidation at an earlier stage of purification. It was also found that the greater deposit of sulphur and longer use of the lime did not affect its affinity for carbon dioxide, but that the impurities were practically removed side by side, with the exception of carbon bisulphide, which could not be sufficiently reduced without the aid of calcium sulphide. A further fact was that the full benefit to the illuminating power could be obtained without the excess of oxygen, and that any excess beyond 0.2 per cent. did not produce any further improvement (though various proportions were tried) until enough was used to affect the illuminating power adversely, showing that the gain in luminosity is not due entirely to the heat set up in the purifiers, or, on the other hand, to the excess of oxygen only. Probably the heat liberates, or prevents deposition of hydrocarbon compounds, for which the excess of oxygen acts as a permanent carrier.

Thus was established a very delicate margin in which to work between gain in luminosity on the one hand and a low rate of sulphur on the other. Further extended experiments were, therefore, made to ascertain whether oxygen added to the purified gas would increase the illuminating power, and if the use of less oxygen through the purifiers would insure steady results as to purity. These experiments (dealing with the whole make of gas) conclusively proved that the illuminating power could not be improved in that way; for no increase resulted even after adding 0.21 per cent. of oxygen, but it was found that, with the lesser addition of oxygen to the purifiers, the sulphur compounds were reduced lower than before, and that they could be maintained steadily at a low rate without fear of carbon dioxide again appearing at the purifier outlet. These experiments also showed that this result could not be depended upon continuously with the theoretical quantity of 0.1 per cent., but that it was reliable if 0.09 per cent. was used; and therefore this quantity has been adopted as the standard. Illuminating power is still gained, though not to the same extent as when 0.2 per cent. excess was used; but the satisfaction of having constantly certain results is secured, and every other advantage except the full increase of luminosity, the difference in which is not, in the opinion of the author, sufficient to compensate for the lack of certainty under the other conditions.

Experiences have proved that, with this process, one set of four purifiers is ample to carry out the purification, and also that, as the effect seems to be more marked when the flow of gas is not at its slowest, as in summer, purifiers somewhat smaller than those of ordinary theoretical dimensions are better than larger ones. It is also certain that a slightly higher percentage of oxygen may be used with a more rapid flow of gas; so that probably smaller purifiers would promote a larger gain in luminosity. Gas purified by lime with oxygen, as applied at Shrewsbury, burns with a very white flame, having a brilliancy which it did not possess before oxygen was used.

Preferably, the oxygen is introduced at the inlet of the purifiers; for although it is easier to let it be drawn through the exhauster, it must then pass through the scrubbers. Then there arises another element to consider—viz., absorption of oxygen in the scrubbers. The rate of this would be variable, rendering it impossible to deliver an accurate quantity into the purifiers. Experiments have been made at various times to ascertain this; but though it was always found that considerable absorption had taken place, the amount of it was never the same, and ranged from 13 to 20 per cent. of the oxygen passing in the different tests. This waste is avoided by its introduction after the scrubbers.

It is absolutely necessary for the successful application of the oxygen that the quantity used should be regularly and accurately proportioned to the sulphureted hydrogen contained in the foul gas. With Mr. Newton's automatic delivery regulator, as used at Shrewsbury, any alteration of percentage can be effected in a few seconds whenever desired. If accurate proportion be neglected, instead of satisfactory results being obtained, there will be nothing but vexation and dissatisfaction. The author has heard of oxygen being sent into the purifiers without any attempt at measurement or regulation; and he was not surprised that those so using it had little or nothing to say in its favor. How could they have? Fancy a chemical process, depending upon accurate proportion (as all such processes must do), with the very first principle ignored. Experiences at Shrewsbury have shown that without accuracy the process can at best be only partially successful, and may produce trouble and annoyance, but that with accuracy its results are satisfactory—almost automatic; and there is the comfort of knowing that the quality of the gas can always be depended upon, which is not to be despised.

Exactly when and where in the purifiers the oxygen is most effective, is a point difficult of determination; but it has always been observed that the greatest heat is apparently near the end of the calcium sulphide, just before the clean lime. There can be no doubt that the gain in luminosity is derived through the effect of heat in the purifiers, and that the action of the oxygen upon the sulphur is also most intense when most heat is set up; but it is very probable that this action commences immediately the oxygen enters the purifiers, and is continued in a varying ratio to this point—some sulphureted hydrogen being still left to form calcium sulphide further on.

On changing an exhausted purifier, the top layer is found rather wet; and although all the rest of the purifier may be inodorous, this layer is never entirely so, and retains the well known dark-green color. The ower layers are usually dry and powdery, and are greyish or greenish yellow; and in the bottom of the purifier will be found a good deal of water. Part of the moisture in the top tier may arise through evaporation from the lutes; but the bulk, and most of the water in the bottom, will be due mainly to the moisture expelled from the calcium hydrate, or will have been formed in the reactions. Some of this moisture condenses on the under side of the cover, whence it saturates the top layer. A reduction of back pressure from these purifiers as soon as all were under the influence of the oxygen was noted; and, what is a great advantage, it was found that the back pressure did not increase as the purifiers become fouler, although they were in use for a longer period than formerly.

In summer time it has been unnecessary to use any cannel at all in order to supply 17-candle gas. Very little was required afterwards until the thermometer fell below 40° F.; while during the severe frosts it was found necessary to use cannel almost as largely as formerly—no doubt because this process could not prevent the usual condensation of hydrocarbons in the gasholders and distributing mains. During the last few months, North Staffordshire unscreened coal, notorious for its sulphury nature, has been used, containing an average of more than 1,200 grains of sulphureted hydrogen in the foul gas; and, though it has been necessary to use rather more cannel to keep up the illuminating power to 17 candles, and there was not a sufficiency of oxygen all the time, the total sulphur in the purified gas has averaged, by the referees' test, only 7.15 grains—a result well worth achievement.

Comparing two full years' working of the oxygen process, during both of which there were prolonged and exceptionally severe winters, with a previous year having a mild winter and without oxygen, the following results were obtained:

Without Oxygen.

Lime used	60½ lbs.	per ton of coal.
Labor	1.80d.	
Cannel used	228½ lbs.	

With Oxygen.

Lime used	47½ lbs.	per ton of coal.
Labor	1.35d.	
Cannel used	152½ lbs.	

If the two winters during the oxygen working had been mild, as was the previous one, the comparison would have been much more favorable for the oxygen process. The coals employed since the process was adopted have been inferior to those used formerly; the cannel being common English, giving 21 to 22 candle gas at the most. It must not be forgotten, too, that the use of oxygen has obviated the nuisance formerly arising from the foul lime.

As regards the expense of plant and of working, the total cost of the present plant, ready for work, was £1,200. The cast iron retorts will, it is believed, now last for three or even four years, and they may be renewed for about £5 10s. each. About 5 cwt. of barium, costing £75 per ton, is required annually to make up loss and waste. The wear and tear of the

remainder of the plant is very slight. The fuel required averages 9 cwt. of coke per 24 hours. The lime placed caustic in the purifier is slaked, but it is so little affected by carbon dioxide, that it is returned to the lime house and used in the purifiers. The soda liquor is used in the steam boilers in place of the composition formerly used, which it entirely replaces, thus costing nothing extra, while it is efficient and harmless to the boilers.

So far the average cost of producing the year's supply, including wear and tear and all actual working expenses, but excluding interest on capital and royalty, has been 3s. 6d. per 1,000 cubic feet of oxygen—the quantity being about 1,000,000 cubic feet per annum; and the royalty adds 1s. per 1,000 feet upon our small production. These figures should, however, be reduced with larger plants, as their first cost is proportionately less; and some advantage may be gained in their working and by commutation of the royalty.

It remains to add that the entire cost of purification for two years with oxygen, including every expense connected with the process, and taking credit for the saving in cannel, was 0.70d. per 1,000 cubic feet of gas sold, against 0.71d., which was the average cost for the previous ten years without oxygen. But, in considering this comparison, it must be remembered that during these two years inferior coal was used, for which nothing is estimated; there has been freedom from nuisance, and constant and satisfactory purity has been obtained, although there has not always been a sufficiency of oxygen. The oxygen process, no doubt, suffers also in comparison, through having been applied during two exceptionally severe winters, as before stated.

[Prepared for the JOURNAL.]

Tar Spraying Device in Use at the Launceston (Tasmania) Gas Works.

By Mr. T. S. CLEMINSHAW, Assoc. Mem. Inst. C. E.

I send you a sketch of a tar spray in use at these works, and made on the premises, that for simplicity and efficiency will, I believe, take some beating. The full size sketch shows two ordinary wrought iron tees, screwed together on to a distance piece, which receives the ¼-inch bore iron tube. For regulation there is a wheel valve on the steam and an iron stop cock on the tar pipe. It raises all the steam required here in place of about 28 cwt. of gas coke, and consumes from 25 to 30 gallons of tar in 24 hours. I find it a *sine qua non* that the tar pipes should be large to allow of easy flow of tar to boiler, and a few feet above the burner there should be a small cistern, say a 5 gallon drum, so that the flow may be regular and constant. The men are much in favor of the arrangement and would be loth to return to coke. The boiler is a Cornish, with 4 inch tubes in a tube plate, in place of the Galloway tubes, and of these there are 19 laid horizontally between the 2 tube plates, and beyond clearing them with a brush twice a week there is little trouble required.

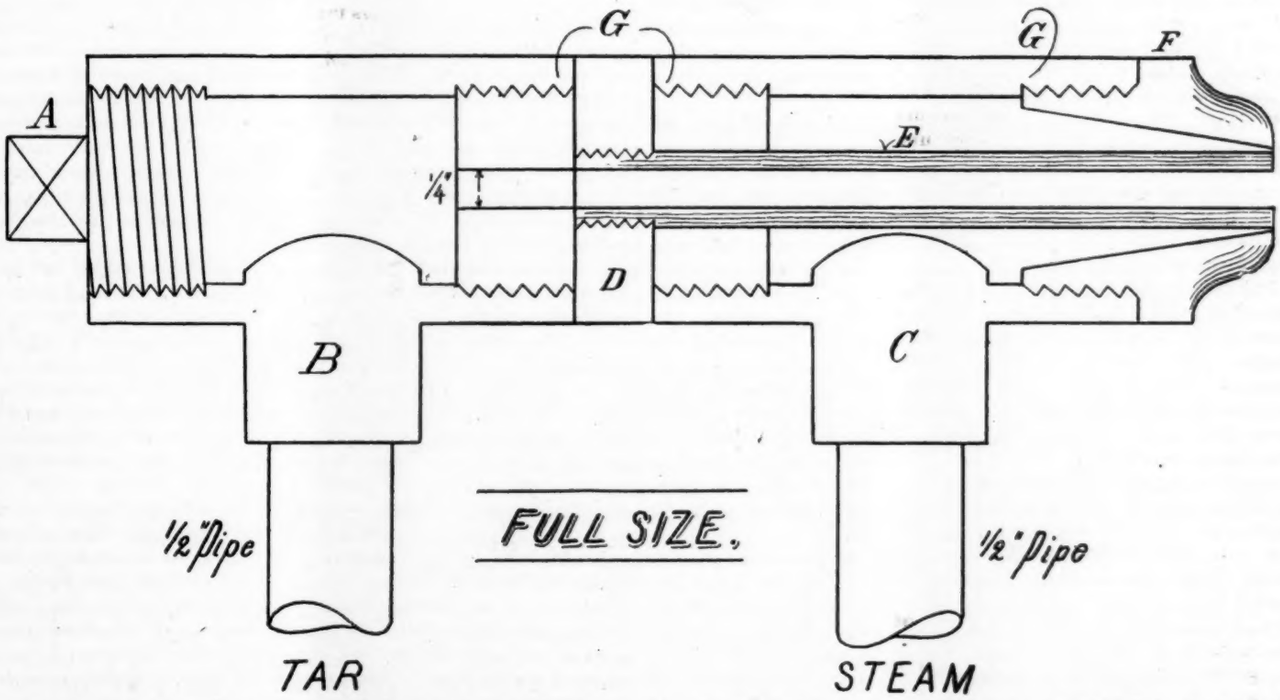
Accept this as a small tribute to your paper, and my object will have been achieved if by its means any brother engineer has been enabled to minimize his stock of tar as well as save coke.

Advances in Electric Heating.

Mr. Frank H. Mason, U. S. Consul General at Frankfort, Germany, in a report to the Home Office on some recent advances in the development of heat by electricity, says:

A discovery so original and so wide in its practical application that it is believed to open a new and important chapter in the use of electricity for heating purposes has recently been announced from Brussels and tested at Berlin. The invention is the joint achievement of two Belgian scientists—Messrs. Lagrange and Hoho—who some days ago applied to the Imperial German Patent Office for patents on a new method of heating, melting and refining metals by means of electrical heat. The means, as designated in their claim, were so simple and the results as therein described so incredible that the patent examiners demanded that before issuing the patent a practical demonstration of the process should be made in their presence. The matter was referred to an eminent and disinterested electrical expert at Berlin, who made the first essays in his private laboratory, and was so delighted with the result that he asked by telegraph permission of the inventors to repeat the demonstrations before the Electro-Technical Society at the German capital. Permission was readily granted, and the experiments were performed before a group of expert electricians with brilliant success. From the account given by one of the experts who was present at these demonstrations and from various other sources the following report of the new process has been derived.

The apparatus consists of a glass or porcelain vase, which may be of any size conveniently adapted to the purpose, provided with a lining of lead connected with a strong conductor of positive electricity. The vase is filled to three fourths its capacity with acidified water. A pair of iron tongs with insulated handles is attached by a flexible conductor to the negative pole of an electrical current generated by an ordinary dynamo. With this simple and inexpensive equipment the following phenomenon is produced.



A—Ordinary 1-inch plug; *B*—1-inch x ¼-inch reduced tee, tar; *C*—1-inch x ¼-inch reduced tee, steam; *D*—Nipple between two tees; *E*—¼-bore turned tar pipe; *F*—Cap, bored 1-13 inch larger than tar pipe, gas thread sizes throughout; *G*—The threads marked thus must be cut true in the lathe, otherwise there is a difficulty in insuring *E* being true at the nozzle *F*.

Tar Spraying Device in Use at the Launceston (Tasmania) Gas Works.

The electrical current having been switched on, a bar of wrought iron or other metal is taken up with the tongs and plunged into the water within the vase. Immediately the water begins to boil at the point of contact; the immersed portion of the iron rises quickly to a red, then to a white heat, and emits a stream of brilliant white light. In a few moments the heat becomes so intense that the iron melts and falls off in bubbles and sparks, leaving a clear, glowing surface in a perfect condition for welding. The heating process has been so rapid that neither the water nor the end of the bar held within the tongs has been more than slightly warmed, and, the current being switched off, the bar, with its submerged end glowing, may be readily held in the naked hand. If, instead of a bar of metal, a stick of carbon is used, the heat in a few minutes produces detached fragments of amorphous carbon, which proves scientifically that a temperature of 4,000° Celsius has been developed. The rapidity of the heating and the limit of temperature to be reached are easily and accurately governed by the strength of the current employed, so that the whole process is under the absolute control of the operator. During the recent experiments at Berlin the measuring instruments registered a tension of 120 volts and an energy of 220 amperes. It was estimated that fully 50 per cent. of the current was directly utilized as heat, whereas the practical limit of such utility has not hitherto exceeded 20 per cent. It is stated by the inventors that by employing a still stronger current a temperature of 8,000° Celsius has been developed. The mechanical importance of this fact will be apparent when it is remembered that this is a degree of heat nearly three times greater than that required to extract iron from the ores, the most refractory of which fuse at about 2,700°.

Divested of all merely technical phraseology and reduced to its simplest terms, the process under consideration may be explained as follows: One of the well known effects of electricity is to separate compound fluid bodies through which it passes into their primitive elements. The current, passing through the tongs and metallic bar into the water, decomposes the latter into its two gaseous elements—oxygen and hydrogen. The oxygen is attracted and gathered on the relatively large surface of the lead lining and produces no noticeable effect. The hydrogen, on the other hand, gathers around the immersed portion of the bar; and, as this has a comparatively limited surface area, it is immediately surrounded with a close envelope or jacket of hydrogen, which, being a bad conductor of electricity, creates a powerful resistance to the passage of the current and thus develops the heat which causes the bar to glow and melt. It is merely an application of the well known law that friction or resistance to the passage of an electrical current causes heat, and the apparent paradox of a piece of cold metal plunged into cold water rising rapidly to a melting glow is as simply and clearly explained as the incandescence of a platinum coil in a vacuum bulb.

It is as yet too early to form any definite estimate of the practical range of this discovery or its commercial value. Thus far it has been applied experimentally only to the welding of various metals, but with such success that it promises, in that special field, to inaugurate a complete revolution. Hitherto electrical energy transformed into heat has found but few successful applications in industry. For welding purposes it has been not only too expensive for general adoption, but it has entailed certain technical defects which have proven serious and difficult to overcome. As the temperature of the electrical furnace has been heretofore difficult to govern, the iron has often been overheated, to the point of partial melting. This seriously affects its quality, as on cooling the metal does not resume its original fibrous texture, but becomes crystalline, with an important loss of tensile strength. Another disadvantage has resulted from the fact that iron, when used for practical purposes, is rarely, or never, entirely pure, but contains more or less carbon. Steel and wrought iron contain less carbon than cast iron, and when heated in the ordinary electrical furnace, where the heat is generated by the passage of the current between two carbon points, particles of loose carbon which have been detached by the current combine with the hot metal and convert it into something analogous to cast iron.

All these difficulties are apparently completely mastered by the newly discovered process above described. For welding purposes it is pronounced perfect. The clean envelope of hydrogen which surrounds the heated metal prevents oxidation, and the welding surface is left free from the effects of sulphur and other impurities, which are always present when iron is heated by a coal fire in an ordinary forge. The quality which entails the largest possibilities, and which has been as yet only superficially investigated, is the capacity of this process to heat quickly and to any desired temperature the end or submerged surface of a mass of iron while the remainder of the mass is left cool and comparatively unaffected by the heat. It is believed that this may lead to important results in the hardening and tempering of armor plates and other objects in iron and soft steel in which great resistance to penetration or abrasion by friction is requisite, while preserving the interior tough and fibrous to resist concussion or strain, as in many parts of machinery. At Essen, Messrs. Krupp & Company are experimenting with it in the hardening of steel cannon; and it is believed that in chemistry this method of producing an intense and easily regulated temperature may lead to the successful manufacture of diamonds, rubies and sapphires through the production of the larger forms of crystallized carbon.

Whether it is applicable as an electrolytic process to the reduction of metals seems to be disputed. One account claims that by it the cost of refining gold, platinum, copper, nickel, and even iron will be reduced 80 per cent., while other authorities assert that, though metallic oxides may be successfully reduced by this method, no other foreign substances contained in the metal will be eliminated by it. In any event, however, the discovery of the principle that has been already demonstrated must open a wide and interesting field of research to the electricians of all countries.

The Application of Machinery for Working Horizontal Retorts

[A paper read by Mr. C. C. Carpenter before the Incorporated Institution of Gas Engineers.]

The problems which the evolution of chemical industry is creating present themselves for consideration from two standpoints—the mechanical and the chemical. This is not less true of one for which it may be fairly claimed that it is not the least important of these manufactures, though it is frequently regarded merely as an offshoot of engineering practice similar to that of water supply—namely, the carbonizing of coal for the manufacture of illuminating gas. Consideration of the *rationale* of carbonizing, like that of other kindred processes, becomes to a great extent an investigation into the best condition for the handling and treatment of the raw material.

It is a significant fact that the former branch of the subject has, judging from what has been said and written upon it, received by far the larger share of the consideration given to carbonizing as a whole; the bulk of the efforts towards its improvement premising hardly any other conditions than the facilitation of the operation of putting coal into a retort, and after a given period drawing out the non volatile residue of coke. Yet nearly 20 years ago one inventor, whose work has since achieved a large measure of success, directed his efforts to reach the goal of complete and, therefore, dual efficiency. By first breaking the coal to a uniform size, then raising it by a power elevator of the simplest description to a hopper, whence the force of gravity was so utilized as to permit its being charged into the retort with scarcely any further expenditure of energy, by spreading the charge in a thin, even layer, which was burnt off in four instead of the customary six hours, Mr. West set up a carbonizing standard which is to day still of the greatest value in connection with this all-important question. In such an operation as has just been described, the only manual labor necessary is that required to push in and withdraw on a level plane a light charging trolly mounted upon wheels and carrying the coal.

Now, if the conversion of coal were a process of distillation instead of carbonization, or, in other words, if instead of leaving behind the bulk of its original weight in the form of coke it wholly vanished up the ascension pipe, the solution of the problem entered upon in 1873 would now most probably have been settled upon something like the lines stated. But the drawing of the spent charge cannot be considered as even the lightest part of the operation; and although the framing of the manual machine then introduced was of some slight service in supporting the weight of the rake rod, yet practically it may be said that no help was afforded to the stoker in this, the most arduous part of his work. To design a power machine was therefore the next and natural step forward.

Before, however, leaving for the present the consideration of the manual machine, one other important point in its favor deserves mention. To charge with a scoop a through retort requires a double gang consisting of at least six men. Its use is, therefore, out of the question in most of the smaller-sized works; and recourse must be had to the less suitable method of shovel charging. With the manual machine, however, two men can perform with ease what it will take six men to do with scoops. The importance of this in the above named cases cannot be easily overstated.

Meantime, other inventors were not idle while the manual machine was being worked out. Among other appliances brought out about this time may be mentioned those of Rowland, Somerville and Foulis. Their examination is of interest, as affording evidence of how largely

the problem of carbonizing was being contemporaneously attacked from the point of designing a machine to put coal into, and draw coke out of, a retort, as distinct from its proper carbonizing and its economic handling from the stores. It should be stated, however, that the Foulis machine was primarily constructed for dealing with cannel coal, in which case irregularities in charging would probably be of small consequence.

Though in one sense foreign to the scheme of this paper, it may, perhaps, not be out of place to ask whether the feasibility of using vertical retorts for carbonizing cannel for gas making purposes has been considered by those engineers depending upon this class of coal. Doubtless many members of this Institution visited, as did the author, in 1887, the works of the Broxburn Oil Company, where about 1,000 tons of shale were being operated upon daily in the Henderson vertical oval retort. For gas engineers the question is perhaps one of theoretical interest only, as the use of cannel for gas making appears to be rapidly diminishing.

There has now to be considered the question of power machines for stoking, as these are available to day. The list is but a small one, and practically is comprised by the Foulis-Arrol, the Woodward, the Ruscoe, the West, and perhaps the Ross types.

As regards the drawer, the author proposes to put aside any particular reference to this part of the plant, because there is a very strong family likeness between most of these machines, and because the conditions of likeness, efficiency and adaptability readily lend themselves to their designing. With the charger, the attainment of these conditions is a far more serious matter. Taking the last of the above list of machines first, the Ross steam stoker affords an excellent object lesson of how widely separate what may be called mechanical and chemical efficiencies may become. As is generally known, this machine consists essentially of a coal hopper terminating in a shoot, at the rear of which is fixed a horizontal pipe perforated with holes. To charge a retort, the hopper shoot is inserted in the mouthpiece, while steam, admitted to the perforated pipe in two or three sharp blasts, blows in the coal in a more or less uneven layer. With practice on the part of the attendant, it was possible to attain some sort of a degree of regularity in doing this; but the process was at best very uncertain. It has been stated by the President that the make of gas was reduced by several hundred feet per ton when working these machines at the Nine Elms works. This can easily be believed. It is one thing to put coal into a retort; it is another to so place it therein that it is carbonized under the best conditions. Though it may be claimed for the Ross stoker that it performs the first operation with admirable simplicity, it undoubtedly quite fails with regard to the second.

In the next machine to be discussed—the West—the action of the scoop in charging by hand is more or less reproduced. The scoop, which is the full length of the retort, enters twice, emptying itself alternately left and right. It is constructed with a thin blade running down its center; the special object of this being to throw over and distribute the coal evenly on the bed of the retort when the scoop is turned. It holds 2 cwt. of coal, so that the charge is 4 cwt. per mouthpiece, or 8 cwt. per retort. In the author's opinion, this heavy charge is a mistake, notwithstanding that the retorts may be easily arranged to burn it off; and that it is in this respect a decided step backwards from the earlier practice of the inventor, to which attention has already been directed. It must be understood, however, that it is not the general design of the machine which this expression of belief calls into question—on the contrary, this has his cordial approval, containing, as it does, many features of excellence—but rather the arrangement of it for dealing with such a heavy charge as has been stated. The carrier to which the scoop is attached runs in horizontal guides on the framing of the machine. Each extremity of this carrier has a chain affixed thereto, which passes for several turns round a drum. By means of a rack and pinion, this drum is rotated in either direction as required, and the carriage with the scoop is thus drawn into or out of the retort. The arrangement is working well in various parts of the country, the installations presenting the latest features being that at the Old Kent Road works of the South Metropolitan Gas Company.

In the Ruscoe machine, like the last, the coal is charged by means of a scoop. There are, however, two of these arranged close together, and side by side. To the heel piece of each a spur wheel is attached; and the two gear together, so that the scoops turn in opposite ways when a rotary motion is applied to one of them. This operation is performed in alternate directions by an ingenious, though simple mechanism when the scoops are fully in or out of the retort as the case may be. Each holds 1½ cwt. of coal, so that the normal charge of 3 cwt. is placed in the retort at one operation, while the design permits the scoops to be made simple and light—thus accommodating themselves to any irregularities of the retort, without throwing undue strain on any part of the machine. They are attached to a carrier, which is moved to and from the retort, by chains running over drums, in much the same manner as in the West machine. The coal is distilled in a very thin layer; and experience of the working of these machines at the Bromley works of the Gas Light and Coke Company will be watched with great interest.

Very similar as regards the charging arrangements is the Woodward machine, in which also two scoops are used. Their two adjacent sides are of greater depth than the opposite ones; the extra portion acting as a blade which distributes the coal well over toward the sides of the retort. The simultaneous rotation of the scoops is effected by means of a crossed chain, running over a drum attached to the heel of each, instead of by the spur wheels in the Ruscoe arrangement. With all the last-mentioned machines, the placing of an even layer of coal presents no difficulty of accomplishment.

In the Foulis Arrol machines the inventors have struck out a new line for themselves. The charger consists of a pusher-head, by which the charge in measured portions is thrust along the bed to its place in the retort, the stroke automatically diminishing until it is charged. A hopper is fixed at one end of the machine, having an opening by which its contents can be discharged between the pusher-head and the mouthpiece on to a short shoot placed therein, and from which it is propelled into the retort as described. The coal-feed is regulated by means of a drum, which is divided up radially by blades into as many compartments as there are portions into which it has been determined to split up the charge. This drum is revolved in conjunction with each stroke made by the machine, and thus delivers coal onto the shoot in quantities which may be increased or reduced as required. The shortening of the pusher stroke is also effected automatically by means of a shaft running parallel with it, and on which is placed a series of stops, which rise through openings in the guide-bar, and thus stop further motion of the carrier until it is reversed. This carrier has attached to each end a steel wire rope, passing round the sheave of horizontal hydraulic rams placed alongside the guides, and which, when pressure water is admitted by a three-way cock, draw it either into or out of the retort. The retort is charged in from six to eight strokes of the machine. A large vertical cylinder and ram is provided to raise and lower the charging frame to suit the various levels of the retorts.

As regards the carbonizing efficiency of the machine, it is a little difficult to speak. It would certainly appear at first sight that a machine which in charging does so in six or seven operations, though these are very rapidly performed, has not on this score so much to recommend it as another in which this is done at one operation; and the author is not of opinion that any reduction thereby obtained in the weight of the machine is altogether a counterbalancing justification. This, however, may indeed turn out an advantage, since by a modification of charging, to which the machine readily lends itself, each portion of the charge of coal could be so placed in the retort as to leave a space between it and the next, thus giving a larger surface for carbonizing, permitting easier egress of gas, and to an extent facilitating the operation of drawing. It seems probable, too, that some difficulty might arise as regards the placing of the charge in an even layer, dependent for extent upon the size of the coal and the shape of the retort. An oval retort is easier to draw than a ⏢, and a circular than an oval. This factor is of importance in studying the action of the pusher, which is, after all, but a rake worked, as it were, backwards.

To illustrate what is meant, the coal may be assumed as having the form of ordinary briquettes, four (say) of which are placed side by side on the mouthpiece and pushed into the retort. Under these circumstances, whether the retort was of circular, oval, or ⏢-shape, the "charge" would, of course, be in an equal layer. Suppose, however, fine coal were substituted for the briquettes; in thrusting this into the retort its upper surface would, during the process, become level, while the remainder of its section would be that of the interior of the retort. With cannel this would, of course, be immaterial; but with caking coal it would not give such a disposition of the charge as would be conducive to obtaining the best results. The author, in noting these points, does not, however, look upon their improvement as presenting insuperable difficulties.

Attention will now be given to the best mode employed for actuating power stoking machines. For this purpose steam, fast-running cotton or wire ropes, coal gas, hydraulic pressure, and compressed air are all available, and have been applied with varying success. The use of steam has not been very successful, since, for practical reasons, this entails the attachment of a boiler to each machine. Boiler repairs, therefore, throw a machine wholly out of action. The large increase of weight entailed is another great objection; while a retort house cannot

be considered as altogether the best place for such an appliance, which can, indeed, be more economically looked after, and more profitably worked, when placed away from the scene of action in a properly constructed house.

As regards cotton or wire ropes, though these have their able advocates, the author cannot look upon their adoption as desirable. In order to transmit the required horse power, it is necessary to run them at a very high speed, while a considerable amount of fast-running gearing and belting is necessary to convert their motion into that required by the machines. The objection is only a valid one in the retort house, which is ever charged (or at least while the machines are working) with a heavily-laden atmosphere of coal and coke dust. The idea was probably obtained from the traveling cranes used by Mr. Webb in the Crewe Locomotive and Carriage Works, where, needless to say, the conditions are quite different.

Messrs. Woodward & Crossley have just introduced a novelty into their stoking machines by the attachment to each of a gas engine, supplied with gas from a bent tube running in a water sealed trough extending the whole length of the retort house. It is rather difficult to see in what way this is a better arrangement than using a flexible rubber pipe. Apart from this, however, while the author holds strongly to the opinion that more should be done by engineers in the direction of adopting gas engines in their works, he cannot consider a stoking machine as the proper place for them. The strains set up in working them would not be a good thing for the framing; and, as a gas engine is certainly a more delicate mechanism than a steam engine, it would be better to use, instead of a minimum of four small ones, one large one, and that, too, for compressing air or pumping water instead of rope driving.

Between these two motive forces there is not much to choose; both have been used to a considerable extent. If for no other reason than the great difference in their specific gravities, it should be more economical to distribute compressed air rather than water. The latter, at a pressure of 750 lbs. per square inch, is used on the author's works for various purposes, one of which is the lifting and traversing of the purifier covers—using lengths of flexible canvas and rubber hose to form the connection between the traveler and the main. In many motors, however, water pressure cannot be employed economically, since the fluid is practically incompressible. Air, on the contrary, can, under pressure, be used expansively, and considerable economy be thus obtained. Whether hydraulic pumping or air compressive engines be used, these should certainly be the most economical of their type.

Both Mr. George Livesey and Mr. Corbet Woodall have in the past paid a considerable amount of attention to, and advocated with great earnestness, the use of economical steam engines for exhausting gas. The author has daily evidence of the wisdom of their foresight; and he would urge that what holds good for exhausting gas applies with equal force to its production. An uneconomical engine means but the transference of capital expenditure from the engine to the boiler; while labor and fuel charges become an everlasting drain. Professor Goodman has made some interesting trials of a two-stage condensing air compressing engine lately introduced, which possesses several features of interest, though it is not possible to include their description within the limits of this paper.

The last aspect of power stoking to be considered is the supply of coal to the machines—a problem frequently difficult of solution in retort houses not specially constructed for the admission of machinery. At the Salford Corporation gas works a very ingenious scheme was worked out for this purpose. This consists of a conveyer running above the charger running the whole length of the retort house. What may be called the buckets of the conveyer are unusually long—nearly as long as the charging hopper. They are so arranged that a stop fixed on the machine causes them to turn over as they pass above it, thus tipping their contents into the hopper. A more generally adopted plan, however, is to place above the path of the charger a fixed hopper, holding about 10 tons, and fed by an elevator from a breaker placed conveniently in the adjoining coal store. The machine is run under these hoppers for replenishment as required.

In considering, three or four years ago, the adoption of machinery in a retort house to which no coal-store was adjacent, and where it was imperative not to lose that afforded by the stage, the author suggested the attachment to the charger of an elevator so arranged as to lift coal continuously, whether stationary or traversing—in the latter case, to clear itself by a plow attached on either side. The arrangement has since been patented.

Quite recently, Messrs. Foulis and Arrol have brought out another method for overcoming similar difficulties. To the framing of the machine an hydraulic radial crane is so attached as to lift coal from the store behind by means of skips, which open from the bottom, and discharge their contents into the machine hopper. Should this arrangement, which has been erected on a very large scale, prove successful, a frequently-recurring difficulty will have been overcome in a very original manner.

From what has been stated in the foregoing paper, it will be seen that, taking as they stand the structural conditions of most retort houses, the problem of drawing retorts by power is of far greater simplicity than that of charging them. It has, indeed, been proposed to take advantage of this almost universal adaptability possessed by the power drawing machine, to use it in conjunction with charging by hand with scoop or shovel.

The author considers, however, that such advantages would be nearly, if not quite, counterbalanced by the necessity for handling the coals once or twice before they are filled into the retort, since the charging floor must be kept quite clear for the passage of the machine. His own belief is that, in many cases, nearly all the advantages of power stoking may be obtained by the use, in conjunction with a power drawer actuated by air or water pressure, of the West manual machine, with fixed hoppers, coal breakers and elevators. In such a case, the only manual labor will be that required to push and withdraw the charging trolley; and the cost of carbonizing would not much exceed 1s. 6d. per ton.

Store hoppers, coal breakers and elevators are necessary adjuncts of any of the systems for economic carbonizing (excepting that of Messrs. Foulis and Arrol) which have been proposed; so that the only additional charge would be for the drawers, manual chargers, and plant for producing the motive force. Retort benches and the retort house would remain exactly what they now are; and in most cases the existing floors would be amply strong enough to carry the light machines described.

In conclusion, the author trusts that the importance to gas engineers of efficient, as well as economical, carbonization will be considered sufficient justification for bringing the subject before the members of the Institution.

Feed Water Heaters.

The *Engineering Record* asserts that almost every steam plant has some form of feed-water heater which utilizes exhaust steam. The device is well nigh universal where the main engine is of the non-condensing type, all of the exhaust steam being passed through the heater. Not infrequently is it used with condensing engines, being placed intermediate between the engine and condenser. It is not uncommon to employ it with condensing engines fitted with direct-acting air or circulating pumps, the exhaust from these and the boiler feed pumps being utilized. It is even suggested and sometimes brought into use in connection with compound or triple-expansion engines, steam drawn from one of the receivers being employed. In one way or another exhaust steam heaters are of almost unlimited application for engine work. The simplest thing used is the so called "open" heater, which is a plain shell having one opening admitting the steam, and another opening admitting water, the latter being arranged preferably to be discharged in the form of spray. This simple device is effective in the highest degree for the single object of heating the feed water. Were it not for the oil with which exhaust steam is contaminated it could not be improved upon. Oily feed water is injurious to boilers, and this has often produced trouble. Modifications of the open principle have been planned and used to some extent, having for an object the removal of the oil and the separation of other impurities which may be deposited in the heater. The design of heater most common provides some arrangement of tube surface whereby the steam and water are prevented from actual contact. Two forms of heaters of this type are used, one consisting of a steam chamber traversed by pipes through which the feed water circulates; the other consisting of a water chamber through which pipes containing the exhaust steam are carried. Of these two classes the former makes no provision for the deposit of sediment. The latter does make provision for this. The former is adapted to situations where the water is of good quality and requires no purification. The latter has ample water capacity and the feed water is allowed time to settle, and thus become purified before it enters the boiler. The most perfect type of heater is one which combines heating with purification, the heating being done in part by exhaust steam which passes through the lower part of the water chamber, and in part by live steam which is admitted through a coil of pipe placed at the top, while the purification is accomplished by the use of a bed of charcoal, or other filtering material, through which the water is finally discharged. The live-steam coil raises the temperature of the water to very near that of the boiler steam, and serves to precipitate some of the salts of lime and magnesia, which would otherwise be

thrown down in the boiler. In this connection heaters which depend solely upon live steam claim a passing notice. They heat the feed water but they act primarily as purifiers, the heating characteristic being simply a means to this end.

The heating of feed water by the waste heat of chimney gases is not practiced to a wide extent in this country. There is no doubt that this method could be adopted more frequently than it now is, with a fair degree of profit. The main thing which appears to stand in the way of the more extensive use of flue heaters seems to be the question of first cost. It is common to employ in these appliances an area of heating surface which is from one-third to one half of the total heating surface of the boiler plant. Consequently, the cost of the heater necessarily bears a large proportion to the cost of the entire plant. The ordinary purchaser of boilers is not inclined to make such an outlay simply for the prospective economy of fuel which may result. This is short sighted policy, because in a great many cases a sufficient economy will be obtained to make it a wise investment. Where coal is $5 per ton and the plant is run 10 hours per day, the saving of fuel obtained by using a suitable heater in the flue will, in many cases, even where the water is already partially heated by other means, secure an economy represented by $1,000 per annum. This is 12½ per cent. upon $8,000, or a sum which would be sufficient to install the boilers for such a plant, and 30 per cent. or more of the cost of introducing the feed-water heater. One benefit from a heater in the flue is not often considered. This device intercepts heat which is lost by carelessness of the attendants in keeping the flues and tubes of the boiler clean. The flue heater is generally provided with scrapers which work automatically, and thereby constantly maintain this portion of the plant in a state of maximum efficiency. Should the boiler surfaces become inefficient by the fouling of the tubes, the heater stands ready to pick up the heat which is thus lost and utilize it.

Recent Decisions in the Matter of Gas Rates Handed Down by the Massachusetts Board of Gas and Electric Light Commissioners.

The Board of Gas and Electric Light Commissioners renders the following opinions in the matter of the petitions of W. Matthews, Jr., Mayor of the city of Boston, against the Boston Gas Light Company, the Roxbury Gas Light Company, the Dorchester Gas Light Company, and the South Boston Gas Light Company: Of W. P. Sawyer et al. vs. the Roxbury Gas Light Company; of Walter Baker & Co. et al. vs. the Dorchester Gas Light Company; of George H. Bond et al. vs. the South Boston Gas Light Company, and the several petitions supplementary to the foregoing, asking that the price of gas supplied by said Companies be reduced.

In the matter of the petitions of W. F. Sawyer et al. vs. the Roxbury Gas Light Company; of Walter Baker & Co. et. al. vs. the Dorchester Gas Light Company; of George H. Bond et al. vs. the South Boston Gas Light Company, and of Hon. W. Matthews, Jr., Mayor of the city of Boston, vs. all said Companies.

These were applications against the Roxbury, Dorchester and South Boston Companies for a reduction in price by separate petitions from consumers in the districts of each Company, and by the Mayor of Boston against the same Companies and against the Boston Gas Light Company, the latter petition being supplemented by that of a large number of private consumers.

Two sets of hearings were given, as requested by the parties, and public advertisement of the same was made as required by law.

To support this request the petitioners rely chiefly upon the facts contained in the various returns filed with the Board, as required by law, and upon the published reports of the Board itself.

The petition of the Mayor against the Boston Gas Light Company was by its terms based upon a special report made by this Board to the Legislature in 1892, which exhibited the relations of the Boston Company to the allied Companies, and concluded with the statement that gas could be supplied by that Company within its territory at a fair profit for $1 per 1,000 feet to all consumers.

At the hearing the case was rested principally upon the facts and figures which that report contained. Although this report was based upon a careful examination of the Company's affairs, its representatives had not been heard in reference to the findings; the investigation was entirely ex parte, and could not fairly be regarded as conclusive against the corporation, nor could a price fixed by the Board be made binding upon the Company without such further hearing as the statute requires. It constituted, however, a prima facie case in support of its conclusions.

At the hearings an effort was made by the Company to control, in some measure, the facts and conclusions of the report; but, in the opinion of the Board, without success. Nor did a careful examination of the returns made by the Company after the date of the report furnish sufficient ground for a modification of its conclusions.

The Board has, therefore, fixed the price of gas supplied by the Boston Company after May 1 at $1 per 1,000 feet, in accordance with its former report and the request of petitioners.

This petition contained a further request that a special and lower rate be fixed for gas supplied to the city of Boston in its corporate capacity, but this request was waived at the hearing, and has not been considered by the Board.

It is to be noted that the Companies named, although having a common control, are yet distinct persons in law, making separate returns of their affairs, would stand as distinct corporations before the courts, and must be treated as such by this Board.

The South Boston Company has numerous shareholders who have held their stocks for years, and have but little interest in common with the present management.

The Dorchester Company sustain in many respects an independent relation peculiar to itself.

The Board has always taken the position that companies which have received from the public as a free gift extensive and valuable privileges, by the exercise of which alone their profits become possible, are bound to return to the public the most efficient service at the lowest prices consistent with a fair profit, and for this purpose to avail themselves of all reasonable facilitation and expedients known to the business in which they are engaged.

If, by reason of superior skill in management, or by the existence of a common control in companies supplying contiguous territories, special economies become available, while the corporation which secures these results is entitled to a liberal reward, the public should also receive, as a matter of sound business policy, some share in the benefits thus made possible.

Many advantages have resulted from the intimate relations between the Companies under consideration, and some share of the possible benefits has already been received by their respective consumers in the reductions in price which all the Companies under consideration have made under the present management. To enable the Dorchester and Roxbury Companies to do this, they have purchased their gas wholly or in part from the Bay State or Boston Companies, and if the present prices are to be maintained, or lower prices reached, this policy must be continued.

The works at Roxbury and Dorchester are not of a character to manufacture gas of the quality now distributed within their territories, nor of a capacity sufficient to supply the demand; neither can they be equipped therefor without a large expenditure of money which must either be provided out of income or additional capital, with the necessary added burden upon the consumer.

The works of the South Boston Company have nearly or quite reached the limit of their capacity, and if the candle power there is to be increased or the consumption largely developed, and the lowest reasonable prices secured, it will be obliged in the near future to purchase at least a portion of its gas from some other company.

It remains to be considered whether a fair and reasonable share of the benefits available from the peculiar relations of the several Companies named has been received by the consumers through the reductions already made in price.

In the opinion of the Board such has not been the case. By the introduction of improved methods and the intimate relations existing between the Companies, although prices have been reduced, the combined profits have been increased to an amount beyond what seems to be the fair and reasonable share which the Company should retain. Their profits have been principally derived, however, from the territory occupied by the Boston Company, and but a small percentage from the suburban Companies. The proper reduction of these profits must, therefore, be secured principally from the reduction of the price charged by that Company.

Even though the suburban Companies—the Roxbury, Dorchester, and South Boston—should purchase all their gas of the same Company and at the same price, it cannot be assumed that they would all be able thereby to supply their consumers at the same price, or at as low a price as is fixed for the territory of Boston proper.

The cost for distribution and for a fair dividend upon the capital employed must vary with the character of each Company's territory, the density of its gas consuming population, and the relation of its output to its capital.

In Boston proper nearly five times as much gas is consumed per mile of main as in any other of the areas mentioned, and to pay the same rate of dividend in the Roxbury Company requires twice as much, and

in the Dorchester and South Boston from three to three and one-half times as much per thousand feet as in the Boston Company.

These facts alone are sufficient to make it impossible for these suburban Companies to supply their respective territories at the same price with each other, or as low as the Boston Company.

A fair and low price which will also be uniform throughout the territory now included in the city of Boston can legally and reasonably be required only when that territory is supplied by a single corporation.

In addition to the cost of manufacture or a fair price for gas purchased and a fair cost for distribution, including management and taxes, the Board has believed it necessary and advisable to add a fair allowance for depreciation and extensions and improvements.

Extraordinary demands for extensions may properly be met by the issue of new capital, but the ordinary demands which a progressive management desires, and is bound to meet, may fairly be provided for out of the income when the price of gas is not made so high as to be burdensome.

This is the course that has been pursued by the best managed Companies in this State for a long term of years by those in which the prices to-day are the lowest—and has probably contributed more than any other single factor to make those low prices a possibility.

A study of the history of the business will show that the benefits arising from the increase of population and output are most surely secured to the consumer by our adherence to this policy. By this the capital charge is kept low, and the relation of capital to output is, perhaps, the most important single factor bearing upon the cost of gas to the consumer. It proves advantageous to the public by making a low price possible, and to the shareholder by adding security to his investment.

An increased consumption demands added facilities for manufacture and distribution, and if the share of capital remains the same, the amount per 1,000 cubic feet which consumers must pay for fair and reasonable dividends rapidly decreases.

The prices fixed assume, as indicated above, that these Companies will continue to buy a part or all of their gas from the Bay State Company of Massachusetts. The prices heretofore charged by the Company have been in excess of what is essential to a fair profit, and have imposed an unjustifiable burden upon the community. This has been due largely to an effort to secure the interest charge on a bond or obligation of $4,500,000 which is included in the liabilities of the Company. It appears that this obligation was given in payment of a contract which has never been fully performed, and that the consideration actually received by the Company therefor was much less than its face value.

As the rate to be paid upon this bond is dependent upon the profits of the Company, its effect upon the public interest is not essentially different from capital stock issued without consideration, and is wholly contrary to the policy of the State as indicated by its legislation, such liabilities cannot be allowed to stand in the way of fair prices by dependent Companies.

The Board has, therefore, endeavored in the prices named to allow to the Bay State Company a fair return only upon the actual value of the investment in its business.

Upon the foregoing considerations and a careful examination of the affairs of the several Companies, as exhibited in their returns and accounts, with allowances for reasonable variations in the cost of labor and materials, the Board recommends that from and after the 1st day of July, A.D., 1893, next, the net price of gas supplied by the Roxbury Company shall not exceed $1.20 per 1,000 feet; by the Dorchester Company shall not exceed $1.30 per 1,000 feet; and by the South Boston Company shall not exceed $1.30 per 1,000 feet.

The Ultimate Composition of Some Alabama Coals and Coke.

The following figures and values were compiled by Dr. William B. Phillips, for the "Records" of the Alabama Industrial and Scientific Society:

The coals of special interest are Pratt mines, the Brookwood and Milldale seams at Brookwood, the Woodstock and Underwood seams at Blockton, the Blue Creek, the Coalburg and the Wadsworth seams at Helena. Proximate and ultimate analyses are given of these coals, and, with the exception of the Wadsworth seam, of the coke made from them. In addition analyses of some 15 or 16 other Alabama coals and lignites are also given. So far as we are aware this is the first attempt that has been made to give the ultimate composition of standard Alabama coals and cokes, and to inquire into the crushing strain of the coke furnished to the blast furnaces. In view of the importance of the subject the results are given herewith in relation to such coals and cokes as come largely into market, giving the proximate and ultimate composition and the crushing strain tests on the cokes:

Composition of Alabama Coals.

No.	Proximate. Vol and Combust. Matter.	Proximate. Fixed Carbon.	Ultimate. Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Sulphur.	Ash.	Moisture.
1,217...	34.30	60.50	73.23	7.98	11.92	1.07	0.60	3.50	1.70
1,218...	33.45	63 20	75.82	10.52	7.51	1.73	1.07	2.00	1.35
1,221...	27 80	58 70	72.47	10.38	1.60	0.40	1.65	11.90	1.60
1,222...	34.80	60.60	72.75	8 61	11.12	1.48	1.44	2.65	1.95
1,223...	35.65	57.30	70.82	10.19	9.95	1.31	0.68	5.25	1.80
1,225...	31.55	64.95	75.05	9.91	8.95	1.62	0.97	2.35	1.15
1,229...	30.50	66.30	73.96	10.50	9.57	1.62	1.15	2.80	1.00
1,231...	25.80	69.90	72.68	10.77	9.83	1.39	1.03	2.80	1.50
1,238...	32.55	65.57	74.59	10.58	9.48	1.31	1.32	1.90	0.82
1,234...	30.45	52.90	60.37	10.70	9.00	1.26	1.72	16.30	0.65

The explanation of the numbers under Coals is as follows: 1,217, Wadsworth seam, Helena, Shelby county. The seam is fiery, but no serious accidents have occurred. 1,218, Pratt seam, Pratt mines, Jefferson county. This is used on a large scale for making coke in beehive ovens at Pratt mines and Thomas, and for a gas coal at Birmingham. The yield of gas is 8,000 cubic feet and of tar 13 gallons per ton of coal; compare also No. 1,225, Tennessee Coal and Iron Company, and Pioneer Company, 1,221, Brookwood seam, Brookwood, Tuscaloosa county; used on large scale for making coke in beehive ovens in connection with No. 1,229. 1,222, Woodstock seam, Blockton, Bibb county; used with No. 1,223 on a large scale for making coke in beehive ovens, and also as a gas coal at Mobile; Cahaba Coal Mining Company. 1,223, Underwood seam, Blockton; see also No. 1,222. 1,225, Pratt mines coal; used as gas coal at Birmingham; see also No. 1,218. 1,229, Milldale seam, Brookwood; see also No. 1,221. 1,231, Blue Creek coal, Jefferson county; used on a large scale for making coke in beehive ovens at Bessemer, De Bardeleben county. 1,234, used by Mobile Gas Light and Coke Company, as a gas coal. It was said to come from the Cahaba field, but the seam was not stated. The yield of gas is 8,000 cubic feet and of tar 10 gallons per ton of coal. 1,238, from Coalburg, Jefferson county; used on a large scale for making coke in beehive and Thomas ovens; Sloss Iron and Steel Company:

Composition of Alabama Cokes.

Number.	Proximate. Vol. and Combust. Matter.	Proximate. Fixed Carbon.	Ultimate. Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Sulphur.	Ash.	Moisture.	Crushing Strain, in Pounds, per Square Inch.
1,204	0.90	94.90	84.87	5.52	4.62	Trace	0.79	3.90	0.30	Cracked 400, broke 1,000.
1,206	1.10	97.00	85.84	4.90	6.46	"	0.90	1.80	0.10	Broke suddenly at 944.
1,219	1.40	89.80	77.86	7.10	5.42	"	0.82	7.90	0.90	Cracked 350, broke 540.
1,220	0.85	85.45	74.61	6.07	3.97	"	1.65	13.45	0.25	Broke at 300.
1,224	0.60	93.20	83.18	6.43	3.14	"	1.05	6.10	0.10	Broke suddenly at 445.
1,226	0.70	93.20	84.27	4.61	3.79	"	1.23	5.90	0.20	Broke at 600.
1,232	0.70	86.00	76.23	6.18	3.06	"	1.23	12.90	0.40	Cracked 486, broke 750.
1,233	0.90	87.25	78.27	7.38	1.51	"	0.99	11.80	0.05	Cracked 720, broke 1,100.
1,235	3.25	83.05	71.74	7.40	5.71	"	1.45	10.80	2.90	Broke at 700.
1,239	2.55	81.15	75.25	4.25	1.99	"	2.21	15.60	0.70	Broke suddenly at 550.
1,244	1.10	82.15	69.18	5.57	7.07	"	1.43	16.55	0.20	Broke suddenly at 320.
1,245	2.50	86.80	76.63	3.56	7.64	"	1.47	7.65	3.05	Broke at 545.
1,246	1.00	82.10	71.25	4.70	5.66	"	1.49	16.60	0.30	Broke at 800.
1,329	3.10	86.45	80.32	5.65	2.65	"	0.93	9.55	0.90	Broke at 486.

The explanation of the numbers under Cokes is as follows: 1,204,

Black Creek, Jefferson county; not made commercially. 1,206, Berry Mountain, Jefferson county; not made commercially. 1,219, Pratt coke. 1,220, Black ends of Pratt coke. 1,224, Cahaba coke, Blockton. 1,226, gas carbon, Birmingham. 1,232, De Bardeleben, 48-hour. 1,233, De Bardeleben, 72-hour. 1,235, gas carbon, Mobile. 1,239, Coalburg, Thomas oven. 1,244, Standard, Brookwood seam. 1,245, Standard, Milldale seam. 1,246, Standard, mixture of Brookwood and Milldale seams. 1,329, Mary Lee, Jefferson county. Coke is now made of washed coal by the Standard Coal and Coke Company, at Brookwood, and by the Mary Coal and Railway Company, at Lewisburg, near Birmingham. It is probable that the quality of the coke made by these companies is now better than that represented by these analyses.

Sangster's Automatic Device for Lighting and Extinguishing Gas Lamps.

There has been recently issued to James Sangster, the well known mechanical expert of Buffalo, N. Y., a patent for a very novel and ingenious apparatus for automatically lighting or extinguishing gas, but which is more especially adapted for street lamps.

The apparatus consists of a small gasholder about 1½ inches square, set in a cup just large enough to admit free play of the holder. The cup contains a non-congealable fluid that serves as a kind of luting and prevents the escape of gas. Extending from above and below the center of the gasholder is a pipe, the lower end of which dips in a mercury seal and acts as a valve, regulating the flow of gas to the burner, which is attached to the upper end of the pipe. The burner is provided with an electric igniting apparatus whereby electric sparks are produced, the current being supplied by a small battery concealed within the lamp post. The sparking electrodes are constructed so as to permit their withdrawal from the gas flame as soon as lighting is accomplished. This feature is new to this class of lighters, and its omission from prior devices was one of the causes of failure of many of the lighters heretofore offered for the purpose.

Whenever it is desired to light the gas lamps, the pressure of the gas in the mains is increased in the usual manner at the works to the operative pressure, to which the lighter is adjusted for about 30 seconds, and is then reduced to normal pressure again. The amount of pressure requisite for operating can be regulated at pleasure, as the device can be adjusted to respond to any fluctuation from the slightest to the most marked. The increased pressure is almost instantly communicated to every lighter connected with the mains, and raises the small gasholder of the lighter, thereby opening the valve and permitting the gas to flow to the burner.

The increase of the pressure also sets the sparking device in operation, lighting the gas. A simple latching mechanism sustains the valve open until a subsequent operative variation of gas pressure is again applied and cuts off further supply of gas to the burner. As the pipe dipping in the mercury makes a valve that cannot freeze, glue up, clog or warp, as experiences show every solid valve is liable to do in time, there is no part that can fail to operate.

Practical use has been made of the device for over a year and warrants the assertion that a long step towards the practical solution of the problem of street gas lighting has been found.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. John Yule, Manager of the Guelph Gas Company, in a circular bearing date of June 8th, forwards the information that under an order in Council, dated June 3d, the Lieutenant-Governor of Ontario has changed the corporate name of the Guelph Gas Company to that of the Guelph Light and Power Company, under which name and style the business of the Company will hereafter be carried on.

Mr. Xenophon Caverno has been appointed Vice-President and General Manager of the Kewanee (Ills.) Gas Light and Coke Company. It is also said that the manufacturing capacity of the plant will be doubled.

The Economical Gas Apparatus Construction Company, of Toronto, Canada, has secured permanent offices at 269 Front street, East, that city.

"W. A. A.," of this city, writing to the Journal under date of the 7th inst., says:

To the Editor American Gas Light Journal: At the meeting of the Western Gas Association, Mr. Somerville stated that he attached an old 10-light meter to the supply pipe as an effective preventative of oscillation, and his "Wrinkle" to set an old meter by the side of a new one is incomprehensible to me, and to others who I have consulted, and who have had a large experience in gas engines, that the thought occurs that he may have been mis-reported. But Mr. Boardman's question whether the old meter was a wet or dry one has the appearance of sincerity, consequently it will not allow of that conception. Will Mr. Somerville give us a little information in exchange for a "Wrinkle" which is a panacea in all cases of oscillation, where both engine and burners are supplied from the same supply pipe. We must presume that the first meter is set to register the consumption of gas for the engines and for lighting purposes. This being so, and the second meter is set also on the supply pipe, how far was the engine from the meter; where was the connection made on the outlet of the first meter, which he evidently means, and not on the supply pipe; and *how* did it prevent the oscillation by the mere fact of the gas passing through an old and a new meter before supplying the engine? The only effect of the second meter would be to reduce the pressure to the engine on account of increased friction. But why a meter? Why not an empty barrel? Why place an obstruction in the shape of an old meter? Mr. Thompson's "Wrinkle" is impracticable owing to the large amount of space a 5-foot holder would occupy. It is needless to say that the strokes of an engine act as an exhaust, and whether the supply pipe be large or small, where there are lights to be supplied from the same pipe that supplies the engine, oscillation must necessarily follow. Now, if a second bag, about half the size of the "reservoir" bag, be placed immediately after the pipe diverges to supply the burners, no oscillation whatever will be perceptible. What the reservoir bag is to the engine so is the second bag to the lights; *ergo*, it insures a steady supply. Apologizing for occupying so much of your valuable space, I am, yours truly, W. A. A.

Recently Mr. Henry C. Winship, President of the Georgetown (D. C.) Gas Company, was appealed to by a representative of a local newspaper for information regarding the truth in a rumor that had been widely circulated that the Company proposed to increase the gas rates. He said emphatically that gas rates would remain as at present unless some unforseen contingency arose, and that no increase had even been thought of. He could not account for the origin of the rumor. There was no necessity for a raise in rates, as the Company was paying a satisfactory dividend and was in a flourishing condition.

Work has been begun on the new holder for the Jamestown (N. Y.) Gas Light Company.

The Berlin Iron Bridge Company, of East Berlin, Conn., will build a new machine shop for the Fuller Iron Works, of Providence, R. I. The peculiarity of this shop will be that the sides are entirely of glass, under the patents lately granted the Berlin Company for this construction. The building will be 90 feet in width and 210 feet in length.

The Standard Gas Light Company of this city reports the placing last month of 700 gas cooking appliances.

Mr. A. B. Slater, Treasurer of the Providence (R. I.) Gas Company, informs us that on and after July 1st next the price charged for gas will be $1.20 per 1,000 cubic feet. The resolution prescribing this course was adopted by the Directors on the 3d inst.

The following act, which purports to revoke the charter of the Bay State Gas Company, was one of the last measures adopted by the Massachusetts State Legislature, prior to the final adjournment of that body at 6 A.M., Saturday, June 10:

House, No. 1,020.—*An Act Relating to the Bay State Gas Company.*

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:

Section 1. The charter of the Bay State Gas Company is hereby revoked and annulled, and said corporation shall be subject to the provisions of sections 41 to 45, inclusive, of chapter 105 of the public statutes, so far as the same are applicable, and subject to the provisions hereinafter contained.

Sec. 2. The Supreme judicial court shall, on application made as provided in section 42 of chapter 105 of the public statutes, or on application of the mayor of the city of Boston, appoint a receiver of the said Bay State Gas Company, who shall hold and distribute the estate and effects of the said Company, as provided in sections 42 to 45, inclusive, of said chapter 105 of the public statutes.

Sec. 3. Sections 1 and 2 of the act shall take effect on the 1st day of December, 1893; unless the said Bay State Gas Company shall, prior to said day, procure or cause a certain obligation for $4,500,000, dated

March 11, 1885, and issued by said Company as part consideration for a contract for the construction of its works, to be legally cancelled and discharged, and shall surrender and deliver the said obligation thus legally discharged to the commissioner of corporations.

Sec. 4. The said Bay State Gas Company may, for the purpose of procuring such cancellation and delivery of said obligation, issue, upon the said delivery to the holder or holders of said obligation, stock to an amount equal to the excess of the actual market value of the property of said Company over $500,000, not including therein any value for its franchises. The said value of said property shall be determined by three disinterested persons to be appointed as commissioners by the Supreme judicial court, upon application of the said Company, after notice to the mayor of the city of Boston, who shall be a party to all proceedings before the said commissioners. Stock may be issued under the provisions of this act only after the findings of said commissioners have been approved by the court after due notice to all parties interested, and only in the event that the aggregate amount of stock, bonds, notes and other liabilities of said Company outstanding at the time of such issue shall not exceed the said value of the property found and approved as aforesaid.

Sec. 5. It shall not be lawful for the said Bay State Gas Company to issue any stock or bonds, or to assume any liabilities, or to pay any consideration for or on account of the principal of the said obligation, or for the purpose of procuring the cancellation and delivery thereof, except as provided in this Act.

Sec. 6. Sections 4 and 5 of this Act shall take effect upon its passage.

THE business of the P. H. & F. M. Roots Company so far this year, compared with the corresponding period in 1892, shows an increase of 25 per cent. In fact, the increase was so pronounced that the Company was obliged to put on a night force, and the shops now are running full 24 hours per day. The following brief summary of the orders for the present season will be of interest from the fact that it shows how busy the gas makers are: Consumers Gas Light Company, Chicago, 1 exhauster and engine with governor, capacity per day, 5,600,000 cubic feet; Milwaukee (Wis.) Gas Company, 3 exhausters and engines combined, total capacity per day, 4,300,000 cubic feet; Consolidated Gas Company, New York, 1 exhauster and engine combined, capacity per day, 4,300,000 cubic feet; Elmira (N. Y.) Gas Company, 1 exhauster and engine combined, capacity per day, 990,000 cubic feet; Menominee (Mich.) Gas Company, 2 exhausters, with pipe fittings, valves, etc., capacity each per day, 70,000 cubic feet; Kerr Murray Mfg. Co., Fort Wayne, Ind., 1 exhauster and engine combined, capacity per day, 115,000 cubic feet; Parkersburg (W. Va.) Gas Company, 1 exhauster and engine combined, with governor, capacity 70,000 cubic feet per day; Central Gas Company, New York, 1 exhauster and engine combined, capacity 2,500,000 cubic feet per day; Nassau Gas Company, Brooklyn, N. Y., 1 exhauster and engine combined, capacity 4,300,000 cubic feet per day; Kalamazoo (Mich.) Gas Light Company, 1 exhauster, capacity 432,000 cubic feet per day; Covington (Ky.) Gas Company, 1 exhauster, capacity 432,000 cubic feet per day; Jamaica Plain (Mass.) Gas Company, 1 exhauster and engine combined, capacity 432,000 cubic feet per day; National Electric and Gas Company, Chicago, 1 exhauster and engine combined, capacity 70,000 cubic feet per day; Muskegon (Ills.) Gas Light Company, 1 exhauster and engine combined, capacity 115,000 cubic feet per day; Rich Hill (Mo.) Gas Light Company, 1 exhauster and engine combined, with pipe fittings, governor, etc., capacity 70,000 cubic feet per day; Aurora (Ills.) Gas Light Company, 1 exhauster and engine combined, with pipe fittings, capacity 432,000 cubic feet; American Gas Company, Philadelphia, 1 exhauster and engine combined, with pipe fittings, governors, etc., capacity 672,000 cubic feet; Western Gas Construction Company, Fort Wayne, Ind., 1 exhauster and governor, capacity 115,000 cubic feet.

ANOTHER evidence of the desire of the gas makers to keep pace with the increased demand upon their resources is shown in the following list of orders taken from the books of Messrs. George Shepard Page's Sons: The Worcester (Mass.) Gas Company, 1 "Standard" washer scrubber, of 750,000 cubic feet capacity, and 1 Walker tar and carbonic acid extractor, of 750,000 cubic feet capacity; East Boston (Mass.) Gas Company, 1 "Standard" machine, capacity 321,000 cubic feet; Holyoke (Mass.) Gas Company, 1 "Standard" machine, capacity 500,000 cubic feet; Jamaica Plain (Mass.) Gas Company, 1 "Standard" machine, capacity 321,000 cubic feet; Trenton (N. J.) Gas Company, 1 "Standard" machine, capacity 750,000 cubic feet, and 1 tar extractor of similar capacity; Nashville (Tenn.) Gas Company, 1 "Standard" machine, capacity 1,000,000 cubic feet, and 1 tar extractor of similar capacity. The Holyoke "Standard" is now being erected, and the machines for Jamaica Plain, Trenton and Nashville are being rapidly completed at the shops of the Isbell Porter Company.

AT the annual meeting of the Hazelton (Pa.) Gas Company the following officers were chosen: Directors, D. Clark, Frank M. Pardee, F. W. Cooper, Wm. W. James and T. D. Jones; President, D. Clark; Secretary F. M. Pardee. A dividend of 4 per cent. was also declared.

THE Chicago Oxygen Gas Company, of Chicago, has been incorporated by Messrs. A. C. DeSouchet, James T. Brady and George N. Jones. It is capitalized in $25,000.

THE United Gas Meter Inspection Company, of Chicago (the concern which was so badly scored some weeks ago by the Chicago Gas Light and Coke Company) has opened a branch establishment in St. Louis, placing a man named James B. Quinn in charge.

A NEW meter house is to be constructed at the 36th Ward station of the Philadelphia municipal gas works. The building will be one story and its dimensions are to be 33 feet 10 inches by 95 feet 10 inches.

SUPERINTENDENT ATWOOD, of the Plymouth (Mass.) Gas Company, is adding largely to the street main system of the Company, and reports of a similar nature come to us from almost every Company in the East.

THE satisfactory work of the water gas plant at St. Louis, under Engineer Chollar's careful hand, has induced the Laclede Gas Company to extend the same, and a contract has just been awarded to the United Gas Improvement Company (the builder of the initial plant) for its duplication. The new plant will be of 1,200,000 cubic feet daily capacity, of the standard Lowe "double superheater" form, and will be complete, with scrubbers, condensers, iron floor, machinery, etc. Work will be commenced at once, and by fall the Laclede Company, with its enlarged plant, will probably have as fine a water gas department, in design, construction, management and operating results, as there is in the country. The United Gas Improvement Company, in the West, has also either recently completed, or has contracts underway, for apparatus at Cincinnati (a duplicate of the St. Louis plant above); at Chicago and Galesburg, Ills.; at South Bend, Ind.; Ann Arbor, Mich., etc. In the East plants have recently been finished at Keene, N. H.; Dover, Del.; South Bethlehem, Pa.; Winsted, Conn., etc.; while work is underway upon contracts with Lowell, Mass., Norfolk, Va., Birmingham, Conn., Bay Shore, N. Y., Altoona, Pa., etc. Work upon the 6,000,000 a day plant for the East River tunnel enterprise is also actively progressing and well along toward completion. Among the above plants are some of the Springer form and some of the "Junior" design, more particularly for small works, but the great majority are of the well known "Double Superheater," modern Lowe type, that has become the standard apparatus of the United Gas Improvement Company.

WE are constantly having held up to us as a model of the virtues of the municipal management of gas works, the example of the works at Wheeling, West Va., which instance the advocates of such management assert is all that could be desired, but the picture presented of or by it this year does not seem to be very even in coloring. Some time ago the authorities installed a municipal electric lighting plant, and the figures given respecting its working for the year go to show that not only did it fail to sustain itself but that it also absorbed all the surplus profit from the operation of the gas works, besides piling up or "holeing out" a deficiency of $30,000. Naturally, the authorities are somewhat perplexed over this woeful reality, which differs so greatly from the roseate promises of the electrical apparatus men, when the latter were "convincing" the rulers of Wheeling that if a gas works were a good thing to own an electric lighting plant would be vastly better. In the midst of the present lamenting, however, it is consoling to surmise that the agitation may eventuate in a policy of properly taxing the entire city for the public lighting (this, when done by gas, is not charged for at all separately, but goes in as a part of the profit of running the gas works), instead of as now causing the users of gas to pay the entire burden of lighting of those who do not use gas. The Wheeling *Intelligencer*, in commenting on the present muddle there, says: "The Gas Board must have an increase of $30,000 in its revenues. This is not because the business of furnishing gas is not profitable, but because the Board has provided and is expected to maintain the system of electric lighting for the streets in addition to furnishing free gas to the public buildings. The consumers of gas have borne the charge of lighting streets and public buildings with gas. There has

been complaint, but the policy has not been changed. Those who buy no gas have as much benefit of the well lighted streets as those who do buy gas and pay for it. Obviously the fairest way to supply the Gas Board with the necessary revenue is to raise it by taxation, so that gas consumers may not be further burdened, and everybody may pay his share for lighting the streets and public buildings. Nobody would have a right to complain of this policy, for it bears justice on the face of it. The other way is to impose on gas consumers a tax under the guise of an increase in the price of gas."

THE plant of the McKeesport (Pa.) Gas Company was badly damaged by fire on the afternoon of June 10. The flames originated in the oil storage division of the works.

THE proprietors of the Johnstown and Gloversville (N. Y.) Gas Company have decided to greatly enlarge their facilities for distributing gas in the Gloversville division of their territory. They have secured a site just south of Hill street whereon to erect a double-lift holder to store 100,000 cubic feet.

THE City Council, of Salt Lake City, Utah, have passed over the Mayor's veto the ordinance granting a 25 year franchise to the Salt Lake and Ogden Gas and Electric Light Company. Having thus secured the necessary legal life, Secretary Moffit says the Company will rebuild the gas plant—the construction to include a new holder of 500,000 cubic feet capacity, and new retort and purifying houses complete—and put down about 22 miles of mains, the same to insure a gas service in the adjoin ing districts known respectively as the Waterloo subdivision, Perkins' addition, Lincoln Park and Popperton Place. The estimated cost of this work is $225,000. The electric division of the plant will also be enlarged at an estimated cost of $175,000.

Mr. GEO. T. THOMPSON, Superintendent of Station B, Laclede Gas Light Company, St. Louis, Mo., writing under date of June 6th, says: To the Editor AMERICAN GAS LIGHT JOURNAL: In the issue of the JOURNAL for June 5th the types have reported me as having asked, with reference to Mr. Somerville's remark on the use of a dry meter to equalize oscillation on a gas engine supply, if its success was "because there was electricity in the containing vessel." Of course, it will be inferred that the word I used was *elasticity*; but you will confer a favor by calling attention to the typographical error, nevertheless.

THE Northern Liberties Gas Company, of Philadelphia, Pa., will construct a purifying house on the South side of Laurel street, east of Front street. It is to be 46 feet by 50 feet and one story high, and will be built of brick and iron.

THE reduction in gas rates recently ordered by the proprietors of the Newton and Watertown Gas Company becomes operative on July 1st. The gross price is put at $1.80 per 1,000 cubic feet, with a discount of 30 cents per 1,000 on all bills paid before the 30th of the month in which the bills are presented. The average price received by the company for all gas sold during the year ended January, 1893, was $1.95 per 1,000.

AT the anual meeting of the Pawtucket (R. I.) Gas Company the following directors were elected: James G. Fales, Lucius B. Darling, Olney Arnold, George L. Walker, Hezekiah Conant, Albert H. Littlefield, Edwin A. Perrin, Stephen A. Jenks, Lyman M. Darling, and Darius L. Goff.

There is every probability that a change in the management and ownership of the gas works at Laconia, N. H., will shortly be announced. If the negotiations are completed, the present works will be dismantled and a new plant will be erected midway of the adjoining villages.

MR. C. J. R. HUMPHREYS, Agent for the Lawrence (Mass.) Gas Company, has returned from a protracted trip through California, brown as a berry and in tip-top health.

THE fund of insurance and renewal of the Portland (Me.) Gas Light Company amounts to $206,834.38.

AT the annual meeting of the Detroit Gas Company the following management was chosen: President, W. C. McMillan; Vice-President, Thomas H. Hubbard; Treasurer, John Byrne; General Manager, Frank P. Byrne; Secretary, John C. Donnelly; Directors, the officers, and Messrs. C. P. Huntington, Camille Weidenfeld, F. R. Pemoerton, F. S. Smith, D. M. Ferry, Jerome Croul, J. H. McMillan and W. H. Wells.

THE Common Council of Auburn, N. Y., has awarded the contract for the public lighting of the city for a period of two years to the local gas and electric lighting companies at the figures hitherto reported in the JOURNAL.

ASSISTANT STATE GAS INSPECTOR CHARLES G. JENKINS tested the gas of the Citizens Gas Light Company, of Wakefield, Mass., recently, with the following result:

		Legal Standard.
Candle power	18.4	16
Sulphur, grains per 100 cubic feet	4.2	20
Ammonia	2.5	10

This is the gas which some of the malcontents of Reading and Wakefield have insisted was far behind the requirements of the State regulations.

THE gas rate at Newton, N. J., has been reduced to $1.80 per 1,000 cubic feet. Where the monthly consumption amounts to 3,000 cubic feet, a discount of 5 per cent. is allowed.

MAYOR MOSBY, of Cincinnati, has vetoed the ordinance recently passed by Councils directing the Cincinnati Gas Light and Coke Company not to charge in excess of 65 cents per 1,000 for the gas supplied by it to the public lamps.

THE Seattle (Wash.) Gas and Electric Fixture Company has been incorporated by Messrs. A. W. Bryan, E. W. Wood and A. M. Gilman.

AT the annual meeting of the Georgetown (D. C.) Gas Light Company the following officers were chosen: Directors, S. T. Brown, H. C. Winship, John Marbury, G. W. Cropley, Wm. Leetch, Morris Adler, Thos. Knowles and Wm. B. Orme; President, Henry C. Winship; Secretary, Thomas Knowles; Treasurer, H. C. Winship. A semi-annual dividend of 4 per cent. was declared, made payable July 1st.

Properties of Aluminum.

Mr. A. E. Hunt, President of the Pittsburgh Reduction Company, says: The slight film of oxide which forms on aluminum exposed to the air is removed by immersion in a dilute solution of hydrofluoric acid, followed by rubbing with a chamois skin saturated with petroleum.

Aluminum loses (permanently) much of its rigidity, and (temporarily) a very large proportion of its tensile strength at a temperature of 400° to 500° F., becomes pasty at 1,000° F., and melts at 1,300° F. The longitudinal expansion of a 100-foot rod of aluminum is .00115 foot per degree F. Its conductivity for heat is, for hard-drawn wire, 38 per cent., and for annealed wire, 38.9 per cent. of that of silver. For electricity its conductivity is as high as 50 per cent. of that of silver. Thus, 1 yard of annealed aluminum wire of 98.5 per cent. purity and of .0325 inch diameter, at 14° C., has the resistance .05484 ohm.

As regularly put upon the market the metal contains less than one-fifth of one per cent. of iron, and is free, therefore, from any appreciable magnetic polarity. By cold hammering, rolling, stamping, drawing, etc., the stiffness and hardness of the metal can be very much increased, as also by the addition of a few per cent. of alloy. Quite a small percentage of silver, chromium, manganese, wolfram or titanium is sufficient to distinctly improve the color of aluminum by approximating it to that of silver. For cold-rolling aluminum the number of passes is about the same as for the treatment of soft steel. There is little difficulty in reducing the metal by rolling alone to a sheet of one two-thousandth of an inch thickness. Aluminum is in the best condition for rolling, etc., at a temperature of from 200° to 300° F.

The temperature of annealing is that at which a pine stick is charred by being drawn across the metal, or that at which a piece of iron appears just red in the dark. Of course the aluminum does not itself appear red hot at this temperature—a fact which our readers will have no difficulty in referring to in the high conductive power, and, therefore, low emissivity of the metal, and to the absence of any appreciable coating of oxide upon its surface.

According to Mr. Hunt, successful results can be obtained in soldering aluminum with an alloy of that metal and zinc, with pure zinc, or even spelter or common soft solder, provided that a flux, "which has just been covered by letters patent," be employed.

THE AMERICAN GAS LIGHT JOURNAL

MONDAY, JUNE 19, 1893.

The Market for Gas Securities.

To-day (Friday) the opening in Consolidated was three points lower than that reported a week ago—126 as against 129. There is no good reason for the decline, in fact there is really good reason for an increase in the value of the shares, as the Company is placing a great number of gas cooking appliances. Equitable is returned at the figures of last time of writing, 170 to 175, and Mutual is offered at 140. The Standard Gas Light Company has declared the regular quarterly dividend of 1 per cent. on the preferred stock, checks for which will be mailed on July 1st. The Company is in good shape, and it is not unlikely that by the first of the year the rate on the preferred will be increased to 5 per cent.

Brooklyn shares show no change, and while there is much talk of a war of rates, it is nevertheless a fact that not many shots have yet been fired. We would not wonder at all if an agreement were reached in respect of consolidation before the summer ends. Chicago gas is at 70¼ to 71, ex-div. The Bay State Company's shares are quoted at 12 to 12½, in consequence of the legislative decree annulling the charter unless the Company cancels that high interest bearing $4,500,000 note. It can, however, issue common stock in place of it. The action of the Detroit City Council in declaring the franchises of the Detroit Gas Light Company forfeited amounts to nothing. The courts will speedily right this thing. Baltimore Consolidated is in somewhat better demand, at 55 to 55½, and we repeat that this stock is a purchase.

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DIVIDEND NOTICE.

STANDARD GAS LIGHT CO. OF THE CITY OF NEW YORK,
71 BROADWAY, NEW YORK, June 9, 1893.

The Board of Directors have this day declared a dividend of one (1) per cent. on the Preferred Stock outstanding at 3 P.M., June 20, 1893, payable July 1, 1893.

Transfer books will be closed from 3 o'clock P.M., June 20, and reopen at 10 o'clock A.M., July 3.

941-3 FERDINAND McKEIGE, Secretary.

Position Wanted

By a first-class man

As Manager of Gas Works in Growing Town.

Best of references from prominent gas men. Would lease a good works if satisfactory arrangements could be made. Coal gas preferred. Address

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To Take Charge of a Small Coal Gas Works

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